The Risks for Late Adolescence of Early Adolescent Marijuana Use

Judith S. Brook, EdD, Elinor B. Balka, BA, and Martin Whiteman, PhD

ABSTRACT

Objectives. The purpose of this study was to assess the relation of early adolescent marijuana use to late adolescent problem behaviors, drug-related attitudes, drug problems, and sibling and peer problem behavior.

Methods. African American (n = 627) and Puerto Rican (n = 555) youths completed questionnaires in their classrooms initially and were individually interviewed 5 years later. Logistic regression analysis estimated increases in the risk of behaviors or attitudes in late adolescence associated with more frequent marijuana use in early adolescence.

Results. Early adolescent marijuana use increased the risk in late adolescence of not graduating from high school; delinquency; having multiple sexual partners; not always using condoms; perceiving drugs as not harmful; having problems with cigarettes, alcohol, and marijuana; and having more friends who exhibit deviant behavior. These relations were maintained with controls for age, sex, ethnicity, and, when available, earlier psychosocial measures.

Conclusions. Early adolescent marijuana use is related to later adolescent problems that limit the acquisition of skills necessary for employment and heighten the risks of contracting HIV and abusing legal and illegal substances. Hence, assessments of and treatments for adolescent marijuana use need to be incorporated in clinical practice. (*Am J Public Health.* 1999; 89:1549–1554)

This study builds on the work of others who have examined the impact of marijuana use on psychosocial functioning by incorporating several desirable features gleaned from previous research[1–5]: (1) the longitudinal design necessary for time ordering of variables and more confident predictions; (2) a 5-year interval enabling examination of long-term rather than short-term and more transitory associations; (3) a time interval within important developmental periods, early and late adolescence; (4) a focus on marijuana's associations with problem behaviors and attitudes, drug problems, and sibling and peer behavior; (5) a difficult-to-access inner-city African American and Puerto Rican sample; and (6) controls on early problems in examinations of the relationship of early marijuana use with later problems.

In the review to follow we focus on studies in which marijuana use is the only independent variable. These are supplemented by and distinguished from studies of drug use, some combining legal and illegal drugs, that have implications for this investigation. We expect early adolescent marijuana use to be related to an increase in problem behaviors such as lowered educational achievement. Previous research regarding this relationship is not conclusive. Some investigators report that earlier marijuana use is associated with subsequent lowered achievement motivation among high school students.[6,7] Others have not found that marijuana use affects educational achievement.[2] However, because the temporal order of the relationship between marijuana use and achievement motivation has been questioned, we used a measure of actual educational attainment rather than one that explicitly includes motivation.[8,9]

In adolescence, marijuana use may have an impact on sexual problem behavior. Newcomb and Bentler[10] used "latent-variable structural modeling" to analyze the effects of adolescent marijuana use on young adult functioning and, in addition, met the criteria for a causal interpretation. Given this topic's significance, we used 2 measures of risky sexual behavior: number of sexual partners and condom use.

Both the use of marijuana or other illicit drugs and the combination of legal and illegal drug use have been found to increase the likelihood of later deviant behavior, including theft, vandalism, drug-related crimes, assault, and suicide.[6,10–14] The present study included theft, vandalism, and violence measures. Our unconventionality measure, frequency of church attendance, has been associated with both marijuana and general drug use.[2,10,15]

Previous studies suggest that early adolescent marijuana use is associated with such drug-related attitudes as tolerance of deviance and risk taking and the perception of drugs as not harmful.[6] Other investigators report that adolescents who experiment with and later increase their use of marijuana minimize the adverse physical and psychological effects of marijuana.[16]

Research indicates considerable stability in marijuana and general drug use behavior.[4,5,17–19] Studies have shown that adolescents who report ever being "stoned" are likely to continue using marijuana. The strongest predictor of any substance use is earlier use of that substance; marijuana use also predicts use of other illicit drugs.[13] This stability may increase the risk of problems with specific drugs.

Drug use has consequences not only for the user. Studies suggest that drug use by a child serves as a behavioral model for his or

The authors are with the Department of Community and Preventive Medicine, Mount Sinai School of Medicine, New York City.

Requests for reprints should be sent to Judith S. Brook, EdD, Department of Community and Preventive Medicine, Mount Sinai School of Medicine, Box 1044A, 1 Gustave L. Levy Pl, New York, NY 10029–6574.

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her siblings and predicts siblings' associating with deviant peers.[20–24] In a longitudinal investigation of African American youth, high levels of gateway drug use were related to increases in peer drug models.[25] Among high school students, regular marijuana users had more friends who exhibited deviant behavior and used drugs and fewer high-achieving friends at follow-up than did nonusers or infrequent users.[6] The present study assessed the relationship of earlier marijuana use with later sibling drug use and deviant peer associations.

Illicit drug use also increases the chances of the user's being a victim of violence.[14] This study examined as well the relationship of marijuana use to being an assault victim.

In summary, this longitudinal study investigated some of the psychosocial risks of early adolescent marijuana use among African Americans and Puerto Ricans. These later correlates include other problem behaviors, drug-related attitudes and problems, and sibling and peer problem behavior. We examined these relationships as a function of sex, ethnicity, and age.

Methods

The data for the present study were obtained in a 5-year follow-up of 695 African American and 637 Puerto Rican adolescents who were initially seen in 1990 (time 1), when the sample was drawn from 11 schools serving the East Harlem area of New York City. At time 1, the sample included 713 girls and 619 boys, and their mean age was 14 years (SD = 1.31). (For more details regarding time 1 procedures, see Brook et al.[26,27]) The 1995 (time 2) sample included 627 African American and 555 Puerto Rican older adolescents and young adults, of whom 648 were female and 534 were male. At time 2, their mean age was 19 years (SD = 1.48).

We used extensive tracking procedures to locate the original participants. A passive consent format was used with parents of participants younger than 18 years. Trained interviewers from the National Opinion Research Center located and interviewed the youths with a structured questionnaire. Virtually all of the participants were interviewed by an interviewer of the same sex and ethnicity. The respondents, following along with their own copy of the questionnaire, answered aloud after the interviewer read the question. For sections regarding drug use, the respondent and the interviewer exchanged booklets, and the respondent marked his or her own responses directly on the questionnaire. Puerto Rican youths were given the option to complete the interview in either English or Spanish. The great majority of respondents received a $25 incentive. Those who did not included, for example, youths in prisons. There, the authorities disallowed any incentive.

We compared the participants seen at both time 1 and time 2 with those who took part only at time 1. There were no differences between these time 2 participants and nonparticipants in terms of age, sex, and ethnicity at time 1. A few of the variables were not assessed at time 1. On those that were, the time 2 participants and nonparticipants differed only in regard to time 1 peer deviance. This difference was probably a chance finding.

Measures

Relationships between drug use and many measures have been established with other samples.[15,18,21,28,29] The scales used in this study were based on item intercorrelations and reliabilities and were grouped as follows: (1) problem behaviors, (2) drug-related attitudes, (3) drug problems, and (4) sibling and peer problem behavior. Several scales were adaptations of measures used in previous studies. The scales were adapted to ensure their linguistic and cultural relevance. The alpha coefficients for the multi-item scales were as follows: self-deviancy, 0.83; violence toward others, 0.79; incapacitated at school or work, 0.70; tolerance of deviance–risk taking, 0.67; perception of drug risk, 0.51; others' intolerance of drug use, 0.77; peer deviancy, 0.79; and violence toward the subject, 0.69. In the subsequent descriptions, scales without a reference originated with the authors.

Marijuana use. At time 1, frequency of ever using marijuana was measured with a single item. For another of our samples, the *R* value of this item, measured twice over approximately the same number of years and age span, was 0.44. The response options ranged from "never used" (1) to "used once a week or more" (5). In this study, the mean level of use was 1.16 (SD = 0.63). The group defined as at high risk reported using marijuana about once a month (a scale response of 3) or more often.

Problem behavior. We determined level of education by asking for participants' current grade. At time 1, all participants were 7th to 10th graders (mean = 8.27, SD = 1.04). At time 2, those not attending school reported the last year they had completed. The high-risk group had obtained an 11th-grade education or less. Self-deviancy, the participants' delinquent behavior, was measured with a 9-item scale emphasizing frequency of theft and aggression.[30] The subject's violence toward others was measured with a 4-item scale concerning frequency of weapon use.[31]

Number of sexual partners was measured with the question "About how many different persons have you had sex with?" The time frame implied was "ever." The group defined as at high risk reported more than 1 sexual partner. Condom use was also measured with a single item, "How often were condoms (rubbers) used when you and your partner had sex?" The group defined as at high risk reported rates of condom use ranging from "never" to "often"; the low-risk group "always" used them.

Incapacitation at school or work was measured with a 3-item scale involving the question "How often in the last 6 months were you high, drunk, or stoned while at school or work [on different substances]?"[32] The group defined as at high risk reported being stoned on at least 1 substance.

Drug-related attitudes. Tolerance of deviance and risk taking was measured by a 6-item scale regarding (1) the extent to which activities such as faking an excuse note are wrong and (2) how well certain behavioral styles, such as liking to live dangerously, described participants.[33,34] Perception of drug risk was assessed with a 3-item scale involving the question "How much do people risk harming themselves if they sometimes use [a specific drug or group of drugs]?"[35] The group defined as at high risk indicated "no risk" in all 3 instances. Others' intolerance of drug use was measured with a 4-item scale in which participants were asked how friends or family would feel if the participants experimented with marijuana or other illegal drugs once or twice. On each item, the group defined as at high risk reported that others would think it is "okay," the most tolerant response possible.

Drug problems. This measure consisted of 4 single-item scales asking if the participant had ever had a problem with each substance (J. Endicott, PhD, written communication, November 1993).

Sibling and peer problem behavior. The 2 sibling measures and 2 peer measures were single-item scales in which participants were asked how many of their siblings and how many of their peers had ever used marijuana and how many had ever used other illegal drugs. The respective high-risk groups had 1 or more siblings or peers who were users. In the 3-item peer deviancy scale, participants were asked how many of their friends had engaged in theft, aggression, or behavior that led to police involvement.[30] The 5-item violence toward the subject scale assessed how often the subject had been assaulted in various ways.[31]

Data Analytic Procedure

We used logistic regression analysis to assess the association between early adoles-

TABLE 1—Longitudinal Odds Ratios for Time 2 Psychosocial Factors Associated With Time 1 Marijuana Use

Time 2 Psychosocial Factor	OR With Control on Covariates (95% CI)	OR With Control on Time 1 Psychosocial Factors and Covariates (95% CI)
Problem behavior		
Level of education (low)	1.91* (1.05, 3.47)	2.00* (1.09, 3.66)
Self-deviance	3.51** (1.59, 7.76)	1.96* (1.03, 3.73)
No. of sexual partners	4.44** (1.27, 15.53)	3.61** (1.02, 12.78)
Less condom use	4.23** (1.45, 12.34)	3.58** (1.22, 10.55)
Incapacitated at school or work	2.37* (1.13, 4.98)	...[a]
Violence toward others	2.59** (1.19, 5.62)	...[a]
Church attendance (less)	2.73** (1.29, 5.81)	2.34** (1.07, 5.15)
Drug-related attitudes		
Tolerance of deviance–risk taking	1.99* (1.08, 3.64)	1.41 (0.75, 2.65)
Perception of drug risk	0.41* (0.20, 0.80)	0.49* (0.24, 0.97)
Others' intolerance of drug use	0.39** (0.16, 0.98)	0.57 (0.28, 1.16)
Drug problems		
Cigarette problems	3.53** (1.59, 7.85)	...[a]
Alcohol problems	2.55* (1.21, 5.38)	...[a]
Marijuana problems	2.49* (1.24, 5.02)	...[a]
Other illegal drug problems	2.69 (0.60, 12.16)	...[a]
Sibling and peer problem behavior		
Sibling marijuana use	2.09* (1.19, 3.69)	1.15 (0.62, 2.12)
Sibling illegal drug use	0.75 (0.27, 2.13)	0.46 (0.15, 1.39)
Peer deviance	2.34** (1.08, 5.07)	1.91* (1.04, 3.49)
Peer marijuana use	3.71** (1.18, 11.63)	1.95 (0.79, 4.76)
Peer illegal drug use	1.02 (0.46, 2.24)	0.99 (0.44, 2.19)
Violence toward subject	2.81** (1.27, 6.22)	...

Note. The covariates are age, sex, and ethnicity. OR = odds ratio; CI = confidence interval.
*$P \leq .05$; **$P \leq .01$.
[a]Variable not available at time 1.

cent (time 1) marijuana use and late adolescent (time 2) psychosocial factors. Odds ratios estimated the increase in odds or risk of time 2 problem behavior associated with an increase in time 1 marijuana use. An odds ratio greater than 1.0 represented a positive relation between adolescent marijuana use and problem behavior. An odds ratio less than 1.0 depicted an inverse relation. Statistical significance was demonstrated if the confidence intervals were above 1.0 for the former and below 1.0 for the latter.

Review of the response distribution for the continuous measure of marijuana use indicated that dichotomizing it to form a high-risk group (those scoring in the top 25%) and a low-risk group (the remaining subjects) provided sufficient numbers for the analysis. The psychosocial measures were treated similarly. Fewer than 5% of the interactions of the variables with age, sex, and ethnicity were significant, so no interaction term was included in the regressions. Each time 2 outcome was regressed against age, sex, and ethnicity. In additional analyses, the time 2 outcome was regressed against its time 1 measure (when available) and against the 3 demographic variables. In analyses of the relation of time 1 marijuana use to later problems with the use of various substances, there were no controls for earlier problems, in part because such problems were more likely only after longer or more regular use.

Results

Problem Behavior

The odds of late adolescent problem behavior given early adolescent marijuana use, with controls on age, sex, and ethnicity, are presented in Table 1. An increase in adolescent marijuana use was associated with a decrease in the likelihood of attaining at least a high school education, a more than tripling of the risk of self-deviancy, and an increase in the risk of all of the other problem behaviors, including violence toward others, sexual problem behaviors, and being incapacitated at school or work. This indicates a significant, long-term association between time 1 marijuana use and time 2 problem behavior. In addition, time 1 marijuana use was related to an increased odds of time 2 self-deviancy, having more than 1 sexual partner, and not always using condoms and decreased odds of finishing high school, despite control on these behaviors at time 1. Time 1 marijuana use was associated with an increased odds of less frequent church attendance at time 2 both with and without control on time 1 church attendance.

Drug-Related Attitudes

Time 1 marijuana use also was related to time 2 attitudes and perceptions about problem behavior. Thus, time 1 marijuana use was associated with subsequent increased tolerance of deviance and risk-taking behavior and with a lesser likelihood of perceiving that drugs are harmful. The relationship between early marijuana use and the perceived harmfulness of drugs at time 2 was significant with control on this measure at time 1. Finally, time 1 marijuana use was related to an increased odds of older adolescents' perceiving others to be tolerant of their drug use.

Drug Problems

Time 1 marijuana use was associated with an almost 4-fold increase in the likelihood of problems with cigarettes and a more than doubling of the odds of alcohol and marijuana problems. However, there was no increase in the risk of time 2 problems with other illegal drugs. Because time 1 data were not available, we could not determine whether the impact of time 1 marijuana use

was sustained when time 1 problems were controlled.

Sibling and Peer Problem Behavior

We examined the relationship of marijuana use with siblings' use of drugs. Time 1 marijuana use was associated with time 2 sibling marijuana use without control on time 1 sibling use. However, time 1 marijuana use was not related to other illegal drug use by siblings. Also, marijuana use was related to an increased risk of having friends who were delinquent and used marijuana but not to an increased risk of having peers who used other illegal drugs. Of these relationships, only the association with having delinquent peers was sustained with control on its time 1 measure. Finally, time 1 marijuana use was associated with an increased risk of the participants' being the victims of violence at time 2.

Discussion

This longitudinal study assessed the relation of using marijuana at least monthly at time 1 to aspects of time 2 psychosocial functioning in a large inner-city sample. The time interval suggests that the relationships are more than transitory, yet the interval is short enough to detect the impact on aspects of time 2 functioning pertinent to developing independence.

Our results suggest that time 1 marijuana use was related to certain time 2 problem behaviors, attitudes, and peer characteristics, all of which are risk factors for further drug use.[36] Many of these relationships were sustained despite control on early functioning (e.g., delinquency). Instances in which they were not sustained may have been due to a controlled mediating factor. For example, time 1 marijuana use was related to time 1 tolerance of deviance, which in turn was associated with time 2 tolerance of deviance. The loss of the relationship between time 1 marijuana use and time 2 tolerance of deviance with control on time 1 tolerance of deviance supports this assumption. However, the relationship between time 1 use and the time 2 psychosocial measure may also stem from their both being related to an antecedent rather than a mediating factor.

Among the problem behaviors, the result for educational attainment is consistent with those of other studies.[7,9] Our finding extends to Puerto Rican youth and confirms for African American youth what has been found with predominantly African American samples. The longitudinal impact on education of even moderate marijuana use is suggestive of an amotivational syndrome.[37] Such use may be associated with a later decrease in the effort necessary to stay in school through graduation beyond whatever achievement and motivational limitations existed earlier. In this way, marijuana use may contribute to limiting the acquisition of skills that maximize employment opportunities in young adulthood.[10,38] In the present study, some of the neuropsychological consequences of marijuana use (e.g., impairment of attention and short-term memory) may have mediated the development of educational problems, leading time 1 users to become dropouts.[9,28,39] This possibility indicates the need for experimental studies of marijuana's impact.

The association of time 1 marijuana use with both number of sexual partners and condom use at time 2 also has wider implications. These sexual behaviors involve a risk of sexually transmitted diseases and pregnancy. Among this study's respondents, having more than 1 sexual partner and not always using condoms might heighten the risk for contracting and transmitting HIV and having shortened lifetimes.

Contrary to the results of Newcomb and Bentler,[10] our findings suggest that early marijuana use is correlated with later deviance beyond the effect of earlier similar behavior. Thus, this relationship, previously found with a predominantly White sample, has been generalized to African American and Puerto Rican youth.[12] Engaging in multiple problem behaviors in adolescence heightens the risk of criminality, alcohol abuse, and drug abuse in adulthood.[40]

Time 1 marijuana use's association with time 2 church attendance may reflect the user's decreasing attachment to conventional institutions. Along with marijuana's other relationships, this association suggests the loosening of bonds to social forces that protect against drug use and unconventional affiliations (e.g., delinquent peers), both of which do not support developing sound independence.[37,41]

Our significant finding for the association of marijuana use with a later perception that drugs are not harmful (after controlling for this attitude at time 1) substantiates others' comparable results.[16] This relationship is also consistent with Bem's self-perception theory, which suggests that people modify their later attitudes to accord with their earlier behavior.[42,43] This attitude change enables youth to avoid confronting the realistic consequences of marijuana use. Bailey et al. implied that denial of risk can result in continued use.[16]

Time 1 marijuana use was related to an increased risk of time 2 problems with cigarette, alcohol, and marijuana use. This finding is consistent with Kandel's results for young adults and with her work regarding "stage of drug use," although we focused on problem use, not just use, of drugs.[44,45] The absence of problems with other illegal drugs suggests that between time 1 and time 2, a sufficient number of marijuana users had not used enough other illegal drugs to have developed problems attributable to them. However, the results of other studies suggest that marijuana users may be at risk for becoming users of other illicit drugs as young adults.[2]

Time 1 marijuana use did not affect time 2 sibling marijuana use after earlier sibling use had been controlled. Perhaps the association with sibling modeling reflects such factors as siblings' previous drinking or having deviant peers.[20,22] Time 1 marijuana use was related to having more deviant friends at time 2 than earlier. This relationship suggests that young people select peers whose unconventional lifestyles are similar to theirs.[6,23,24] Finally, our finding of the likelihood of time 1 marijuana users' becoming assault victims is consistent with the instances of violent deaths suffered by alcohol and illicit drug users.[14]

A family interactional perspective focusing on the association of earlier problem behavior with later drug use has guided much of our work.[15] Examining this interrelationship over time indicated that the antecedents were often also the effects of drug use.[12] This study of marijuana use further substantiates those effects.

This study has several limitations. First, it relied on unconfirmed self-reports. Studies indicate that self-report is a reasonably valid means of investigating drug use.[46] Moreover, this study's validity was enhanced by (1) ensuring confidentiality, (2) having participants mark their own answers to the drug items, (3) using unfamiliar interviewers, and (4) using a school-based sample rather than those accused of criminal acts.[46,47] Also, including peer self-reports rather than relying on the accuracy of participants' perceptions of peer behavior would have enhanced this study. Still, our results are consistent with those of most of the investigators cited.

Second, there may be an underlying variable, such as self-control or attraction to antisocial values, that is related to both marijuana use and psychosocial factors. This variable may have contributed to the relationships found. However, controlling for the time 1 measure may also have controlled for this underlying variable (e.g., controlling for time 1 self-deviance controlled for time 1 antisocial values). For some of our dependent variables, we did not have time 1 measures. Such findings need replication with controls. Finally, only future research will indicate

whether the associations between early and late adolescence are sustained into young adulthood.

Because the present study was correlational, we have minimized the use of causal language. However, the longitudinal design and the controls on prior psychosocial factors and demographic characteristics suggest causality and thus inferences for public health. Early marijuana use may have an influence on later problems stemming from cigarette, alcohol, and marijuana use; number of sexual partners; and failure to always use condoms.

Hence, assessments of marijuana use should be incorporated into clinical practice with adolescents. More information is needed regarding treatment for early users and their concurrent problems to prevent the later development of problem behavior. Understanding which early users are most vulnerable to subsequent difficulties would help in identifying those who would benefit most from treatment. □

Contributors

J. S. Brook planned the study, supervised the data analysis and interpretation, and wrote the paper. E. B. Balka helped plan the study, interpret the data, and write the paper and made most of the revisions. M. Whiteman also assisted with the planning of the study and the interpretation of the results.

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